

**A description of two new species of Anillina from North Carolina with notes about
the geographical distribution of the genus *Anillinus* Casey, 1918
(Coleoptera: Carabidae: Bembidiini)**

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Taxonomy, new species, Coleoptera, Carabidae, Anillina, U.S.A., North Carolina

Abstract. Two new species of anilline ground beetles are described from the Appalachian Mountains of eastern United States: *Anillinus campbelli* sp. nov. from Van Hook Glade, 4 mi. W Highlands (NC) and *Anillinus pecki* sp. nov. from three sites along the Blue Ridge Pkwy (Avery and Wilkes Counties, NC). New chorological data about *Anillinus lowae* Sokolov et Carlton, 2004, *A. steevesi* Barr, 1995, *A. langdoni* Sokolov et Carlton, 2004 and *A. barri* Sokolov et Carlton, 2004 are given.

INTRODUCTION

Several important contributions were devoted to Carabidae Bembidiini of the subtribe Anillina of North America by Jeannel (1937, 1963a, 1963b), Barr (1996) and more recently by Sokolov et al. (2004, 2007), Sokolov & Carlton (2008, 2010) and Sokolov & Watrous (2008). The contributions by these specialists list, in fact, two genera for southeastern United States: *Serranillus* Barr, 1996, with 3 species, and *Anillinus* Casey, 1918, containing 35 species. A problem remains with *Anillinus nantahala*, a species described a few years ago (Dajoz, 2005) from Nantahala National Forest (Macon Co., NC): the description was poor, the illustrations non-informative, and all the type material remains inaccessible in France (Carlton, 2010 pers. com.).

Recently the colleagues Yves Bousquet of Ottawa (Canada) and Petr Bulirsh of Prague (Czech Republic) sent me for study the North American Anillina preserved, respectively, in the Canadian National Collection and in his personal collection. Material coming from the Canadian National Collection was collected over many years by some of the most active North American entomologists including Aleš Smetana to whom this volume is dedicated. Surprising has been the presence of two new taxa in this material coming from an area which was already known for some other species.

MATERIAL AND METHODS

The following acronyms are used for the Museums or private Collections:
CBu private collection Petr Bulirsch, Praha, Czech Republic;

CGi private collection Pier Mauro Giachino, Torino, Italia;
CNCO Canadian National Collection, Ottawa, Canada;
USNM U. S. National Museum, Smithsonian Institution, Washington, U.S.A.

The following acronyms are used for the type material:

HT Holotype
PT, PTT Paratype (s)

The specimens come entirely from stored dry museum collections. For this reason, contrary to what has been achieved by Sokolov et al. (2007) and Sokolov & Carlton (2010) it has not been possible to carry out a DNA analysis.

In specimens used for the drawings of the habitus, male and female genitalia were previously embedded in Canada balsam. The genitalia were pinned beneath the specimens. The drawings were made by means of a camera lucida connected to a Leica DM2500 microscope, with interferential contrast. Specimens were measured optically using a Leica MZ 12.5 stereomicroscope equipped with micrometric ocular. Measurements are in mm.

For measurement uniformity it was decided to use the same methodology as proposed by Sokolov et al. (2004), so measurements for various body parts are coded as follows:

ABL = apparent body length, from clypeus to apex of elytra;
WH = width of head, at level of first orbital setae;
Wpm = maximum width across pronotum;
Wpa = width across anterior angles of pronotum;
Wpp = width across posterior angles of pronotum;
LP = length of pronotum from base to apex along midline;
WE = width of elytra, at level of 2nd discal setae;
LE = length of the elytra, from apex of scutellum to apex of left elytron.

Only ABL measurements are reported, the other measurements are given as 7 ratios.

General width: WH/Wpm and Wpm/We.

Body parts: Wpa/Wpp, Wpm/Wpp, Wpm/LP and WE/ABL.

RESULTS

Anillinus lowae Sokolov et Carlton, 2004

Material examined. N. CAR., Water Rock Overlook, Mile 452, Blue Ridge Pkwy., 5800f, xi.1.1967, J.M. & B.A. Campbell, Berlese sample No 4, 1 ♂, (CNCO); N. CAR., Haywood Co., Blue Ridge Pkwy., Woodfin Cascade, 1400 m, 28.v.1986, A. Smetana, 1 ♂, (CNCO); N. CAR., Grt. Smoky Mts. Nt. Pk., Smokemont Cmpgd., 10.vi.1982, Y. Bousquet, 1 ♂, (CNCO); N.C., Jackson Co., Whiteside Mts., nr. Highlands, 1450-1500 m, 21.v.86, A. Smetana, 5 spec., (CNCO, CGi); N.C., Macon Co., Hwy 64 nr. Dry Falls NW Highlands, 1000 m, 16.V.1986, A. Smetana, 11 spec., (CNCO, CGi).

Notes. According to Sokolov et al. (2004) and Sokolov & Carlton (2010), *A. lowae* is widely distributed within the Great Smoky Mountains National Park straddling the border between NC and TN, but also known from Transylvania Co. (SW North Carolina). The new sites from Macon Co. and Jackson Co. complete the distribution range of this species in SW North Carolina.

Anillinus steevesi Barr, 1995

Material examined. GA., Dade Co., Cloudland Canyon St. Park, 16.v.72, S. & J. Peck, 236 Rhododendron litter, 40 spec., (CNCO, CGi); ALA., Jackson Co., 10 mi. N Scottsboro, 16.v.1972, S. & J. Peck, ber. 237, 19 spec., (CNCO, CGi); Alabama, Blount Co., Blountsville, ix.7.76, T. King, 1 ♂, (CBu).

Notes. According to Sokolov et al. (2004) and Sokolov & Carlton (2010), *A. steevesi* is widely distributed from western part of Great Smoky Mountains National Park (Tennessee: Blount Co. and Swan Co.) SW to Mississippi (Tishomingo Co. and Natchez Trace Pkwy). These new sites complete the distribution range of this species in Alabama.

Anillinus langdoni Sokolov et Carlton, 2004

Material examined. Tenn., Gt. Smoky Mts. N. P., 8 km S Gatlinburg, Chimney Top, 8.vi.82, Bousquet & Davies, sift leaf litter, 1 ♂ 1 ♀, (CNCO, CGi); USA: TN: Cocke Co., 6 mi. SE Cosby, V.31.1983, sift forest litter, DSChandler, 7 spec., (CNCO, CGi);

Notes. These two sites fall into the distribution range of this species (Sokolov et al. 2004, 2007).

Anillinus campbelli sp. nov.

(Figs. 1, 3, 4, 7, 9)

Type locality. N. CAR., Van Hook Glade, 4 mi. W Highlands, 3500 f.

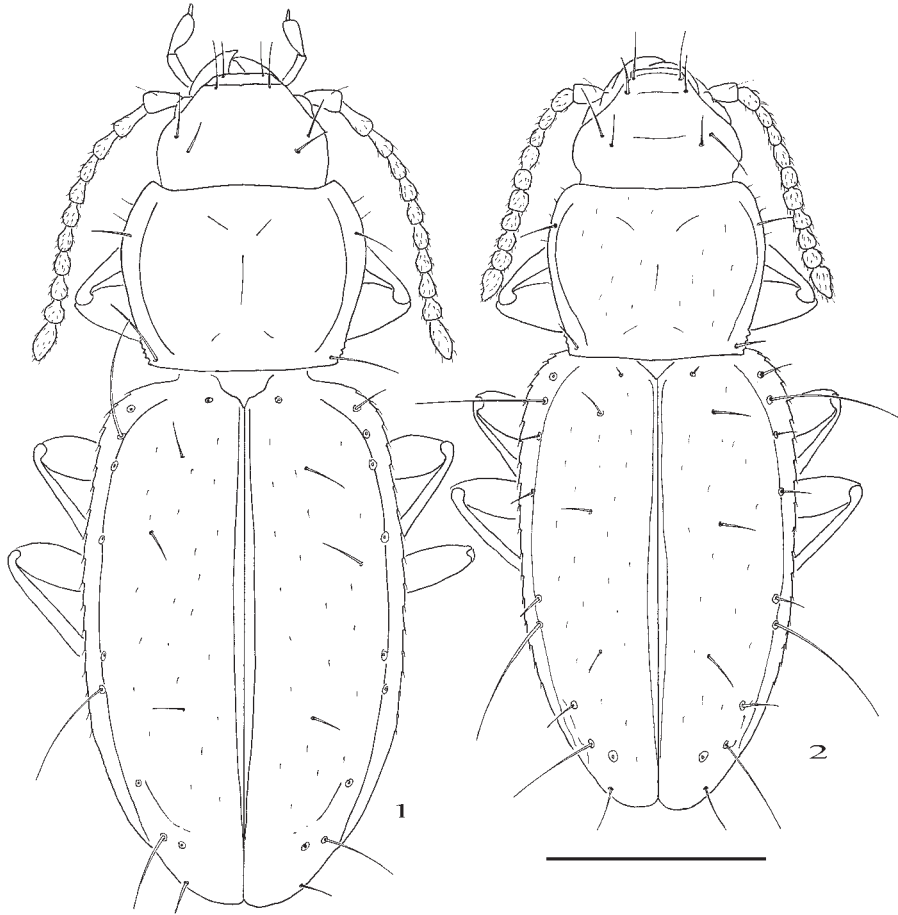
Type material. Holotype (♂): N. CAR., Van Hook Glade, 4 mi. W Highlands, 3500 f, viii, 30-31, 1967, J.M. & B.A. Campbell, Berlese sample #3, (CNCO). Paratypes: (4 ♂♂ 7 ♀♀): N. CAR., Van Hook Glade, 4 mi. W Highlands, 3500 f, viii, 30-31, 1967, J.M. & B.A. Campbell, Berlese sample #3, (CNCO, USNM, CGi).

Description. Medium-sized for this genus (ABL range, 1.91-2.09 mm). Habitus markedly convex, ovoid (WE/ABL, 0.38), head of moderate size (WH/WPm, 0.69), elytra relatively wide (WPm/WE, 0.76). Colour of body brunneorufous, appendages testaceous.

Head with microsculpture evident across frons and all the vertex. Dorsal microsculpture distinct across the pronotum. Antennae robust, moniliform, long, reaching the base of the pronotum when stretched backwards.

Pronotum moderately convex and less transverse ($WPm/LP = 1.34$), with margins significantly and rectilinearly convergent towards the base ($WPm/WPp = 1.32$). Anterior angles evident, prominent. Posterior angles slightly obtuse. Sides denticulate before the posterior angles. Width between the posterior angles equal to the width between the anterior angles ($WPa/WPp = 1.00$).

Elytra ovoid, with the maximum width in the middle, markedly convex, not depressed along the suture, length normal for the genus ($LE/ABL = 0.59$), with traces of 1–2 interneurons. Humeri moderately prominent, slightly rounded; post-humeral margin denticulate, with an obvious crenellation, distinct up to the 6th pore of the umbilicate series and bearing setae; pre-apical area not emarginated. Vestiture of elytra short (less than one-quarter of the length of discal setae).



Figs 1-2. Habitus of *Anillinus* spp.: 1- *A. campbelli* sp. nov., HT ♂; 2- *A. pecki* sp. nov., HT ♂. Scale: 0.5 mm.

Chaetotaxy as in fig. 1: basal umbilicate pore big, foveate; umbilicate series of type A (sensu Jeannel, 1963 and Giachino & Vailati, 2011); elytra bearing three discal setae.

Males with simple metafemora.

Median lobe of the aedeagus (Fig. 3) sharply arcuate in the basal part, with a simple narrowly rounded apex. Ventral margin and right side of the median lobe without poriferous canals or setae. Inner sac with a dorsal copulatory, W-shaped, sclerite. Inner sac ventral to sclerites without rows of triangular spines. Left and right parameres (figs. 3, 4) long (with the right one particularly long), enlarged, ventral margin with four poriferous canals, bearing four short setae.

Spermatheca (Fig. 7) question mark-shaped weakly sclerotized, with the proximal part of cornu more than two times longer than the distal part. Ramus reduced, nodulus short.

Stylomers as in Fig. 9.

Differential diagnosis. A medium sized *Anillinus* species (ABL = 1.91-2.09 mm) closely related to *A. langdoni* Sokolov et Carlton, 2004, following the Identification Key provided by Sokolov et al. (2004) and Sokolov & Carlton (2010), for the head having the vertex totally covered with microsculpture, for the ratio $WPa/WPp = 1.00$, for the shape of the aedeagus and of the spermatheca. It differs from *A. langdoni* by the larger size, by the pronotum width between posterior angles equal to the width between anterior angles, by the W-shaped sclerite of the inner sac and by the ventral part of inner sac of aedeagus without rows of triangular spines.

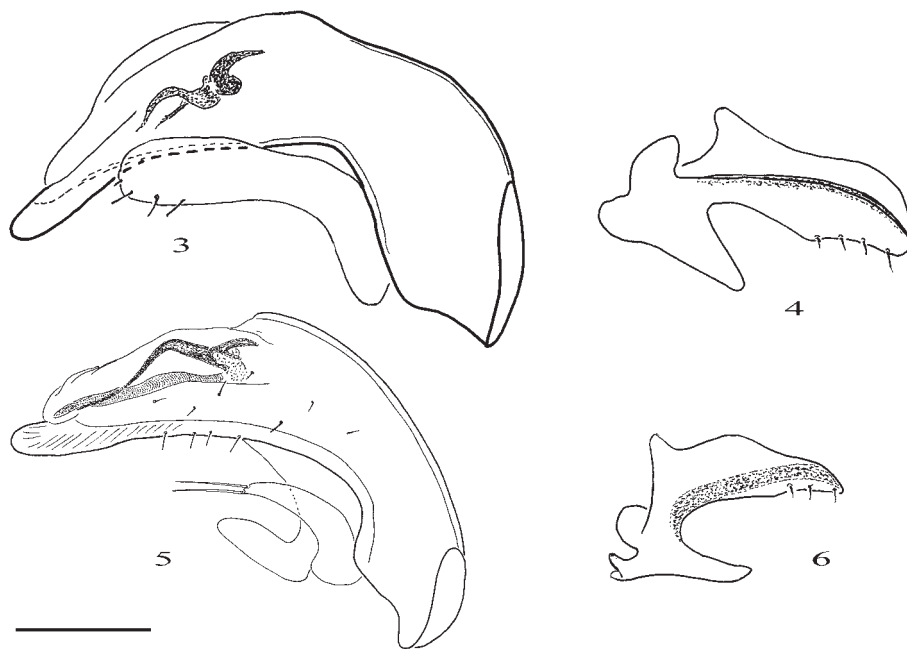
Etymology. This new species is dedicated to one of its collectors, the Canadian entomologist John M. Campbell.

Distribution, ecology. *Anillinus campbelli* sp. nov. is currently known only from the type locality, Van Hook Glade, 4 miles W Highlands (North Carolina), where it was collected at heights of about 1050 m a.s.l. by sieving forest litter.

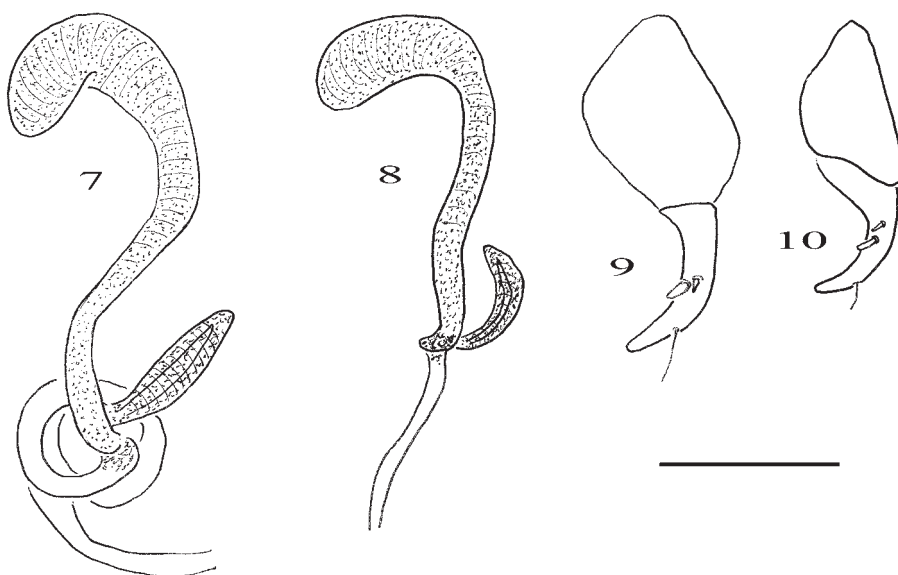
Anillinus barri Sokolov et Carlton, 2004

Examined material. Tenn., Polk Co., Cherokee Natl. Forest, May 4, 1954, W.J. Cloyd, *Brachymyrmex deplis* Emery, 1 ♂, (CNCO).

Notes. Following Sokolov et al. (2004) *A. barri* is known only from Monroe Co., TN. The new site Polk Co., TN, extends the distribution range of this species to SW.



Figs 3-6. Aedeagus (3, 5) and right paramere (4, 6) in lateral view of *Anillinus* spp.: *A. campbelli* sp. nov., HT ♂ (3, 4); *A. pecki* sp. nov., HT ♂ (5, 6). Scale: 0.1 mm.



Figs 7-10. Spermathecae (7, 8) and right stylomeres (9, 10) of *Anillinus* spp.: *A. campbelli* sp. nov., (7, 9); *A. pecki* sp. nov., (8, 10). Scale: 0.1 mm.

***Anillinus pecki* sp. nov.**

(Figs. 2, 5, 6, 8, 10)

Type locality: N. CAR., Avery Co., Linville Falls, 3500f, Blue Ridge Pkwy., mi 317.

Type material. Holotype (♂): N. CAR., Avery Co., Linville Falls, 3500 f, Blue Ridge Pkwy., mi 317, 16.viii.1981, rhodo. litter at log, S. Peck, (CNCO). Paratypes: (4 ♀♀, 2 ♂♂): N.C., Jeffress Pk. Wilkes Co, Blue Ridge Pk. mi. 272, 17.viii.81, log-leaf litter, S. Peck, (CNCO, USNM, CGi); (2 ♀♀): N. CAR., Avery Co., 4000 f, Grandfather Mt., mi. 304, Blue Ridge Pk., 17.viii.81, log-leaf litter, S. Peck, (CNCO).

Description. Medium-sized for this genus (ABL range, 1.91-2.09 mm). Habitus markedly convex, ovoid ($WE/ABL = 0.37$), head of moderate size ($WH/WPm = 0.75$), elytra relatively wide ($WPm/WE = 0.78$). Colour of body brunneorufous, appendages testaceous.

Head with microsculpture evident across frons and vertex except in paramedian areas of vertex, where it is indistinct. Dorsal microsculpture light but distinct across most of the pronotum; indistinct along the midline. Antennae robust, moniliform, short, not reaching the base of the pronotum when stretched backwards.

Pronotum moderately convex and transverse ($WPm/LP = 1.27$), with margins significantly and rectilinearly convergent towards the base ($WPm/WPp = 1.23$). Anterior angles evident, slightly prominent. Posterior angles slightly obtuse. Sides denticulate before the posterior angles. Width between the posterior angles greater than the width between the anterior angles ($WPa/WPp = 0.94$).

Elytra ovoid, with the maximum width in the middle, markedly convex, not depressed along the suture, length normal for the genus ($LE/ABL = 0.58$), with traces of 1–2 interneurs. Humeri moderately prominent, slightly rounded; post-humeral margin denticulate, with an obvious crenellation, distinct up to the 6th pore of the umbilicate series and bearing setae; pre-apical area not emarginated. Vestiture of the elytra short (less than one-quarter of the length of discal setae).

Chaetotaxy as in fig. 2: basal umbilicate pore big, foveate; umbilicate series of type A (sensu Jeannel, 1963 and Giachino & Vailati, 2011); elytra bearing three discal setae.

Males with simple metafemora.

Median lobe of the aedeagus (Fig. 5) evenly arcuate with a simple narrowly rounded apex. Ventral margin and right side of the median lobe with numerous poriferous canals bearing short setae. Inner sac with dorsal copulatory, filament-like, sclerite, abruptly curved at the basal third, weakly sinuate in the apical third; ventral sclerite sub-rectilinear, diverging from the base of the dorsal sclerite, overlapping it basally, not curved ventrally. Inner sac ventral to sclerites without rows of triangular spines. Left paramere (Fig. 6) long, not enlarged, ventral margin with two-three poriferous canals, bearing two-three short setae. Right paramere (Fig. 5) short, not enlarged, paramere apex with two poriferous canals, bearing two long setae.

Spermatheca (Fig. 8) question mark-shaped weakly sclerotized, with the proximal part of cornu twice as long as distal part. Ramus reduced, nodulus short.

Stylomeres as in Fig. 10.

Differential diagnosis. A small sized *Anillinus* species ($ABL = 1.69-1.75$ mm) closely related to *A. docwatsoni* Sokolow & Carlton, 2004, following the Identification Key provided by Sokolov et al. (2004) and Sokolov & Carlton (2010), for the head with paramedian patches of effaced microsculpture on vertex and for the shape of aedeagus. It differs from *A. docwatsoni* by its smaller size, pronotum width between the posterior angles larger than the width between the anterior angles and ventral part of the inner sac of the aedeagus without rows of triangular spines.

Etymology. This new species is dedicated to its collector, my colleague and friend Stewart B. Peck from Carleton University, Ottawa (Canada).

Distribution, ecology. *Anillinus pecki* sp. nov. is currently known from some sites in North Carolina, in the Counties of Avery and Wilkes along the Blue Ridge Parkway, where it was collected at heights between 1050 and 1200 m a.s.l. by sieving *Rhododendron* litter and log-leaf forest litter.

ACKNOWLEDGEMENTS. I am very grateful to my colleagues Yves Bousquet (Agriculture and Agri-Food, Ottawa, Canada) who made me possible to study the North American Anillina material deposited in the Canadian National Collection, Ottawa, Canada, and Petr Bulirsch (Prague, Czech Republic) who enabled me to study the material from his collection. I am particularly indebted to Christopher E. Carlton (Louisiana State Arthropod Museum, Baton Rouge Louisiana, U.S.A.) and Igor M. Sokolov (All-Russian Institute for Plant Protection, St.-Petersburg, Russia) for their valuable suggestions during the drafting of this contribution. My special thanks are extended to Achille Casale (Dipartimento di Zoologia e Genetica Evoluzionistica of the University of Sassari, Italy) for his critical remarks on the manuscript.

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Received: 21.3.2011

Accepted: 1.4.2011